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IS 9185-2 (1979): Endurance (life) test for electronic and electrical components, Part 2: Mechanical endurance [LITD 2: Reliability of Electronic and Electrical Components and Equipment]



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“Knowledge is such a treasure which cannot be stolen”

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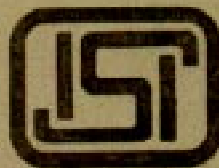
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Indian Standard

ENDURANCE (LIFE) TEST FOR ELECTRONIC AND ELECTRICAL COMPONENTS PART II MECHANICAL ENDURANCE

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ENDURANCE (LIFE) TEST FOR ELECTRONIC AND ELECTRICAL COMPONENTS

PART II MECHANICAL ENDURANCE

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Indian Standard

ENDURANCE (LIFE) TEST FOR ELECTRONIC AND ELECTRICAL COMPONENTS

PART II MECHANICAL ENDURANCE

0. FOREWORD

0.1 This Indian Standard (Part II) was adopted by the Indian Standards Institution on 6 June 1979, after the draft finalized by the Reliability of Electronic and Electrical Components and Equipment Sectional Committee had been approved by the Electronics and Telecommunication Division Council.

0.2 This standard (Part II) deals with mechanical endurance (life) test with or without electrical loading as applicable to electronic, electro-mechanical and electrical components. The other part (Part I) of this standard covers thermal endurance test.

0.3 This test is primarily intended to be used as part of the type tests, lot acceptance tests or reliability evaluation tests when called for by the relevant component specification which should also give the information as required in 13.

0.4 This standard is one of a series of Indian Standards on reliability of electronic and electrical components and equipment. Other standards published so far in the series are given on fourth cover.

1. SCOPE

1.1 This standard (Part II) describes a uniform test procedure for carrying out mechanical endurance (life) test with or without electrical loading on electronic, electromechanical and electrical components.

2. TERMINOLOGY

2.1 For the purpose of this standard, the definitions given in IS:9000 (Part I)-1977* shall apply.

*Basic environmental testing procedures for electronic and electrical items: Part I General.

3. OBJECT

3.1 The object of this test is to assess the mechanical operational endurance of electronic, electromechanical and electrical components in the normal operating mode with or without a specified electrical loading for a specified number of mechanical actuations/rotations.

4. TEST CHAMBER

4.1 For carrying out this test either at elevated or low temperature, if required by the relevant specification, suitable test chambers as specified in 4.1.1 or 4.1.2 shall be required.

4.1.1 The test chamber shall conform to the relevant provision of IS:9002 (Part II)-1977* as applicable for carrying out dry heat test in accordance with IS:9000 (Part III)-1977† both for non-heat dissipating and heat dissipating items.

4.1.2 The test chamber shall conform to the relevant provisions of IS:9002 (Part I)-1977‡ as applicable for carrying out cold test in accordance with IS:9000 (Part II)-1977§ both for non-heat dissipating and heat dissipating items.

4.2 The test chamber used for this test shall be capable of maintaining the specified temperature within the required tolerance at any point in the working space of the chamber for the required duration.

4.3 The temperature in the chamber shall be checked with temperature sensing devices located so as to comply with the conditions specified in 2.1.2 of IS:9000 (Part I)-1977||.

5. PREPARATION AND MOUNTING OF COMPONENTS

5.1 The components shall be prepared and mounted as required by the relevant component specification in their normal operation position by their normal mounting means.

5.2 With this test conducted at elevated temperature, the relevant precautions as given in 5.2.1 to 5.2.3 for mounting of the components and 5.2.4 shall be observed.

5.2.1 Care shall be taken during the mounting of the components to prevent excessive mechanical stress/torque (for example, bending of components during the mechanical actuations/rotations shall be avoided).

*Specification for equipment for environmental tests for electronic and electrical items: part II Chamber for dry heat test.

†Basic environmental testing procedures for electronic and electrical items: Part III Dry heat test.

‡Equipment for environmental tests for electronic and electrical items: Part I Chamber for cold test.

§Basic environmental testing procedures for electronic and electrical items: Part II Cold test.

||Basic environmental testing procedures for electronic and electrical items: Part I General.

5.2.2 When groups of components are subjected to tests simultaneously or when mounting racks are used for mounting components, the mounting distances between components and the length of the leads shall be as specified by the relevant component specification. When the distance is not specified, it shall be such as to minimize the temperature of one component affecting the temperature of another.

5.2.3 The thermal conduction and other relevant characteristics of the mounting and connections of the components shall be specified in the relevant component specification. Components intended for use with specific mounting devices shall be mounted accordingly.

5.2.3.1 Where the components are designed for mounting in a heat sink with unspecified characteristics, the heat sink should possess thermal capacity and thermal conduction adequate to maintain its temperature close to the specified test temperature.

5.2.3.2 Where nothing is known about mounting characteristics, the thermal conduction of the mounting shall be low and for all electrical purposes, the components shall be thermally isolated.

5.2.4 Components fabricated of different materials which may have a detrimental effect on each other and affect the results of the test shall not be tested simultaneously in the same chamber.

6. SEVERITIES

6.1 The severities, as indicated by the temperature and the number of mechanical actuations/rotations, shall be specified in the relevant specification. The values shall be selected from those given in 6.1.1 to 6.1.3.

6.1.1 For elevated temperature testing, the relevant component specification shall select one of the following temperature severities:

$100 \pm 2^{\circ}\text{C}$

$85 \pm 2^{\circ}\text{C}$

$70 \pm 2^{\circ}\text{C}$

$55 \pm 2^{\circ}\text{C}$

$40 \pm 2^{\circ}\text{C}$

6.1.2 For low temperature testing, the relevant component specification shall select one of the following temperature severities:

$-10 \pm 3^{\circ}\text{C}$

$-25 \pm 3^{\circ}\text{C}$

$-40 \pm 3^{\circ}\text{C}$

$-55 \pm 3^{\circ}\text{C}$

$-65 \pm 3^{\circ}\text{C}$

NOTE — The mechanical endurance test with electrical loading at low temperature is not normally called for.

6.1.3 Number of Mechanical Actuations/Rotations — For the number of mechanical actuations/rotations, the relevant component specification shall choose a severity from the series given below:

1, 2, 5×10^n where n assumes integral values between 2 and 6.

NOTE — The relevant component specification may specify a higher severity, if so required.

The rate of mechanical actuations/rotations (that is, the number of actuations/rotations per second or minute or hour) shall be specified by the relevant component specification.

7. PRECONDITIONING

7.1 If necessary, the components may be preconditioned as required by the relevant component specification.

8. INITIAL MEASUREMENTS

8.1 The components shall be visually inspected and electrically and mechanically checked as required by the relevant component specification.

9. CONDITIONING

9.1 Unless otherwise specified, this test shall be conducted at the standard atmospheric conditions for testing.

9.1.1 This test may, however, be conducted either at elevated temperature or at low temperature, if so required by the relevant component specification. In such a case, the relevant component specification shall also state and specify one of the temperature test severities to be chosen from those specified in **6.1.1** or **6.1.2**.

9.1.1.1 Thermal conditioning shall be done in accordance with IS:9000 (Part II)-1977* for conditioning at low temperature and in accordance with IS:9000 (Part III)-1977† for conditioning at elevated temperature.

9.2 The component shall be exposed to the specified temperature conditions (see **9.1**) throughout the test while being subjected to the specified number of mechanical actuations/rotations chosen from the severities specified in **6.1.3**.

9.3 Electrical Stresses — When required, the electrical stresses as specified in the relevant component specification shall be applied to the components during this test.

*Basic environmental testing procedures for electronic and electrical items: Part II Cold test.

†Basic environmental testing procedures for electronic and electrical items: Part III Dry heat test.

9.3.1 The relevant component specification shall specify the following electrical stresses to be applied to the component during the test:

- a) Electrical load (test voltage and test current), and
- b) Duty cycle.

10. INTERMEDIATE MEASUREMENTS

10.1 The relevant component specification may call for measurements during or at the end of conditioning while the component is still in the chamber. If such measurements are required, the relevant specification shall define the measurement(s) and period(s) after which they shall be carried out. For these measurements, the component shall not be removed from the chamber.

NOTE — Measurements preceded by recovery, which would require removal and reintroduction of the items into the chamber, are not permissible during the conditioning.

If it is desired to know the performance of the types of item before the end of the prescribed duration, one additional lot will be required for each specified duration. Recovery and final measurements shall be performed separately for each lot.

11. RECOVERY

11.1 The component shall remain under recovery conditions for a period adequate for the attainment of temperature stability, with a minimum of 1 hour.

11.1.1 When several components are tested simultaneously and where the 1 hour recovery period is adequate for a single component, the maximum period for recovery shall be 2 hours and all measurements shall be completed at the end of this period.

11.2 If required by the relevant specification, the component shall be switched on or loaded and measured continuously during the recovery period.

11.3 If the standard recovery conditions given are not appropriate for the component to be tested, the relevant specification may call for other recovery conditions.

12. FINAL MEASUREMENTS

12.1 The components shall be visually inspected and electrically and mechanically checked as required by the relevant specification.

13. INFORMATION TO BE GIVEN IN THE RELEVANT SPECIFICATION

13.1 When this test is included in the relevant specification, the following details shall be given as far as they are applicable:

- a) Preparation and mounting;
- b) Preconditioning;
- c) Initial measurements;
- d) Whether the test is to be conducted at the standard atmospheric conditions or elevated temperature or low temperature;
- e) Temperature severity (temperature), if applicable;
- f) Electrical stresses (test voltage, test current and duty cycle), when required;
- g) Number of mechanical actuations/rotations;
- h) Rate of mechanical actuations/rotations;
- j) Permissible temperature difference;
- k) Period of recovery, if other than that specified in **11**;
- m) Final measurements; and
- n) Deviation from the normal test procedure, if any.